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(54) Title: PAPER COMPOSITE FOR MAKING PACKAGES FOR LIQUID OR GRANULAR PRODUCTS		
(57) Abstract		
<p>Paper composite for realizing three-dimensional packages characterised in that it consists of a layer of yieldable paper (4) having a degree of yieldingness in any direction not lesser than 10 % and of at least an impermeabilizing film (6) having yieldingness compatible with that of yieldable paper.</p>		

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PAPER COMPOSITE FOR MAKING PACKAGES FOR LIQUID OR GRANULAR PRODUCTS

5 This invention relates to a paper composite for realizing three-dimensional packages for possibly solidifiable products in the liquid state, or for granular or powder products, a method for realizing such packages and a package obtained through the method.

10 Methods for packaging in metered quantities possibly solidifiable liquid products or granular or powder products for consumption are known. In one of these methods, half-casings of substantially rigid plastics material for example polypropylene are thermoformed and joined together along their edges to form a cavity, which can then be filled by a 15 traditional filling machine. If the product is to be used in the liquid state, granular state or powder state the package obtained in this manner is ready for marketing after sealing. If however the product is to be used in the solid state (for example ice-creams), after the filling operation the filled 20 with the liquid product and sealed package is refrigerated and preserved under refrigerated conditions until its consumption.

 Independently of the nature of the packaged material,

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these known packages have the advantage of being formable in practically any shape, but also have certain drawbacks, and in particular:

- 5 - a considerable cost, related to the cost of the plastics material used,
- practically no ecological merits, given the non-biodegradable nature of the plastics used,
- a certain weight, with consequent transport costs,
- a space requirement after use, in that the used package
- 10 cannot be substantially reduced in volume compared with the full package.

It is also known to package generally liquid products using a continuous tubular element of polytene- or bipolytene-coated cardboard which is filled in portions separated by transverse welds, transverse cuts then being made through said welds. The package is generally of tetrahedral, parallelopiped or cylindrical shape, depending on the manner in which the transverse welds are made and on the folding operations to which the package may be subjected 15 after its separation from the continuous tubular element.

This known method considerably accelerates the packaging operations but has certain limitations both in terms of obtainable shapes, and of overall dimensions, of the package

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after its use, and of costs.

An object of the invention is to eliminate such drawbacks and to realize a composite for forming metered packages, practically of any shape, for products in the 5 liquid, granular or powder state, which has a low cost.

A further object of the invention is to realize very light packages, such as to minimize packing and transport costs.

10 A further object of the invention is to provide a method which enables the package to be reduced to minimum volume after use.

A further object of the invention is to provide a method which enables traditional commercially available packaging equipment to be used.

15 All these objects are attained according to the invention through a paper composite for realizing packages in three-dimensional form as described in claim 1.

The invention also foresees a method for realizing packages as claimed in claims 5 to 21.

20 The package so obtained is claimed in claims 22 and 23.

The present invention is described in detail hereinafter with reference to the accompanying drawings, in which:

Figure 1 shows in enlarged section view a portion of paper

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composite according to the invention;
Figure 2 schematically illustrates a line for implementing
the method of the invention;
Figure 3 is an enlarged perspective view of the open mould of
5 Figure 2;
Figure 4 is a vertical section through a closed mould during
the stage preceding the introduction of the
pressurized fluid;
Figure 5 shows the same view as Figure 4, but during the
10 stage following the introduction of the pressurized
fluid;
Figure 6 is a perspective view of a package extracted from
the mould and awaiting filling;
Figure 7 schematically shows in cross section view an open
15 mould to implement the method in a different
embodiment,
Figure 8 is the same mould as Figure 7 in a further
embodiment, and
Figure 9 shows a package extracted from the mould and
20 awaiting filling.
As can be seen from the figures, the paper composite 2
according to the invention consists of a layer of yieldable
paper 4 and of an impermeable plastic film 6. The yieldable

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paper 4 presents a degree of yieldingness such as it enables it to be permanently extended transversely and longitudinally by at least 10%, and preferably by 20% and specifically by an extent such as to enable the desired final configuration 5 without laceration of the package to be obtained.

The plastic film 6 is preferably of polytene or another possibly peelable thermoplastic material with degree of yieldingness not lesser than that of the layer of yieldable paper to which it couples and with suitable weldability 10 characteristics.

The joint between the two layers 4 and 6 is preferably formed continuously by traditional methods, which do not form part of the invention and are not further described. In the embodiment shown in Figure 2 the composite 2 is wound around 15 a reel 8 and is folded longitudinally so that the two polytene layers 6 face each other.

In the embodiment shown in Figures 2-4 the method of the invention also uses a mould formed from two half-moulds 10 movable relative to each other and each comprising a cavity 20 12 bounded by a slightly projecting rim 14 comprising an interruption 16. The cavities 12 of the half-moulds 10, the projecting rims 14 which bound them and the interruptions 16 in the projecting rims 14 perfectly mate when the two half-

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moulds 10 are brought together.

In the drawings the two half-moulds 10 are shown for simplicity with a single impression, whereas in practice it is preferable to use moulds with several impressions to
5 accelerate the packaging operations.

It is also foreseen that the cavity 12 of each half-mould 10 extends externally into a duct 18 which opens into the interruption 16 provided in the rim 14 bounding the cavity 12, and mates with the adjacent duct of the other half-mould 10.
10

The method of the invention is as follows:
after the composite 2 has been folded longitudinally into two parts and has been positioned in this folded state between the two half-moulds 10, these are brought together so as to
15 retain it between them (see Figure 4). The two contacting rims 14 are then heated so that they thermoweld together the two polytene layers 6 lying between them, but with the exception of the interruption 16.

After the thermoweld has been made, compressed air is
20 introduced through the duct 18, which air may be also hot, with the double purpose of heating the polytene 6 in order to soften and sterilize it, and to stretch the two sheets of yieldable paper 4 retained between the rims 14 to cause them

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to adhere to the surface of the respective cavity 12 (see Figure 5). The stretching of the paper is facilitated by the softening of the polytene.

5 After this insufflation stage the two half-moulds 10 are separated to allow removal of the internally impermeabilized paper package 20 having a configuration corresponding to the cavities of the half-moulds 10, this configuration being stable because of the permanent deformation to which the yieldable paper 4 and the polytene 6 forming the composite 10 have been subjected (see Figure 6).

This package can then be transferred to the filling stage, preferably effected with automatic machines, and then to the stage for sealing the polytene 6 at the interruption 16, through which the product to be packaged was introduced, 15 which product may be liquid, pasty, granular or powder.

Depending on the nature of this product, the package 20 once sealed can be subjected to further treatment or be transferred to storage. For example if the product is to be consumed in the liquid state (shampoo, detergent, milk, 20 water, etc.) or granular or powder, it can be stored directly. If the product has been temporarily heated to bring it to the liquid state, although being solid at ambient temperature (chocolate or cheese or soap), it is sufficient

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to wait for it to cool in order for it to assume and maintain the shape of the package 20, which it does even after it has been removed for consumption. If however the product is a liquid for preparing an ice-cream or ice-lolly, it has to be 5 frozen after filling, however this can be done shortly before consumption.

Briefly, independently of the product to be packaged, this first embodiment of the method according to the invention is based on the principle of using polytene, the 10 traditional purpose of which is to impermeabilize the yieldable paper against the liquid product during its filling and storage, but also to impermeabilize the paper against the air, hence enabling paper to be subjected to an operation which was never previously possible.

15 If it is foreseen that the package could receive an extensive deposit of moisture (condensate), it is preferable for the layer of yieldable paper 4 to comprise a polytene film 6 on both its surfaces.

A second embodiment of the method according to the 20 invention foresees that, after thermowelding the polytene, the fluid fed under pressure through the duct 18 is not air, but instead the actual liquid product to be packaged, this causing the paper to stretch until it adheres to the walls of

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the half-moulds 10. Again in this case the product to be packaged can be variously treated depending on its nature, but in all cases the invention comprises the formation of the package within the mould by the actual product to be 5 packaged. If this product is solidifiable, ie whether it is solid at ambient temperature but has been previously heated to facilitate filling, or whether it is liquid at ambient temperature but is to be refrigerated after filling, the invention involves mutual action between the liquid and the 10 package. In this respect, during the filling the liquid product forces the paper and the polytene to assume the shape imposed by the mould within which it is housed, whereas during solidification it is the package, previously formed by the liquid, which now constitutes the mould for the liquid 15 during the solidification.

In addition, in both the embodiment of the method according to the invention, in particular for packaging edible solidifiable liquid products, the filling stage can be preceded by inserting a traditional stick 21 for example of 20 wood or plastic into the mould, to remain retained by the product as it solidifies and form the support necessary for hand-held products.

A third embodiment of the method according to the

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invention foresees that the leaf of composite 2 is faced with the layer of paper 4 to the cavity 22 of a mould 24 and then is bounded in correspondence of the continuous edge of this cavity. Subsequently the mould 22 is subjected to depression 5 through suitable suction channel 26 provided therein so as to cause the tangential stretching of said composite until to obtain its adhesion to the inner surface of this cavity. In order to obtain a better stretching it is foreseen that a complementary punch 28 faces the cavity 22 of the mould, 10 which during the suction step contributes, through mechanical way, to carry out the stretching of the paper.

It is preferable that such a mechanical effect is supported by a pneumatic effect, and for this purpose the punch 28 is provided with a plurality of channels 30, through 15 which it is possible to direct a jet of air, if desired hot, against the composite leaf.

The valve-shaped package 32 so obtained may be filled with the product to be packaged and subsequently may be closed through thermowelding of a transparent film 34 or of a 20 complementary valve.

In any event, independently of the embodiment used, the composite according to the invention and the method to realize the desired packages have considerable advantages,

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and in particular:

- they enable packages to be formed practically without any limitation on their shape,
- they enable traditional commercially available forming and filling equipment to be used,
- they enable very light packages of low cost to be formed, which can be reduced to a minimum volume after use.

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C L A I M S

1. Paper composite for realizing three-dimensional packages characterised in that it consists of a layer of yieldable paper having a degree of yieldingness in any direction not lesser than 10% and of at least an impermeabilizing film having yieldingness compatible with that of yieldable paper.
- 5 2. A composite as claimed in claim 1 characterised in that the impermeabilizing film (6) consists of a thermoformable and thermoweldable material.
- 10 3. A composite as claimed in claim 2 characterised in that the impermeabilizing film (6) consists of polytene.
4. A composite as claimed in claim 1 characterised in that the impermeabilizing film consists of an aluminium alloy.
- 15 5. A method for realizing packages through the paper composite according to one or more of claims 1 to 4 characterised in that a leaf of composite (2) is faced to the cavity of at least a mould, said leaf being bounded in correspondence of the continuous edge of said cavity (22) and subsequently the tangential stretching of said leaf of
- 20 composite is carried out so as it adheres to the inner surface of said cavity and a concave valve (32) is obtained, having the shape of this cavity, to be sent to the following steps of filling and closure.

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6. A method as claimed in claim 5 characterised in that the stretching of the leaf of composite is carried out for depressurisation caused between this and the inner surface of this cavity (22).

5 7. A method as claimed in claim 5 characterised in that the stretching of the leaf of composite is carried out by mechanically pushing said leaf within the cavity by a punch (28) having shape substantial complementary to that of the cavity (22).

10 8. A method as claimed in claim 7 characterised in that the mechanical effect is supported by a pneumatic effect by insufflating, through said punch (28), a jet of compressed air against said leaf of composite.

9. A method as claimed in claim 8 characterised in that hot
15 air is used.

10. A method as claimed in claim 5 characterised in that after the filling, the concave valve (32) is closed with a sheet (34) of thermoweldable material applied to the edge thereof.

20 11. A method as claimed in claim 5 characterised in that after the filling the concave valve (32) is closed with another one placed overturned over the first one and thermowelded to it near the touching edges.

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12. A method as claimed in claim 5, characterised in that:
- two leaves of composite (2) are brought together such that
the thermoformable thermoweldable plastics films (6) are in
mutual contact,

- 5 - the two leaves (2) are welded together along a perimetral
line (14) of predetermined pattern comprising at least one
interruption (16),
- a pressurized fluid is introduced through said interruption
(16) into the interspace bounded by said leaves (2)
10 maintained between two closed half-mould (10) which between
them form a cavity (12) bounded by said perimetral welding
line (14), to hence stretch said leaves (2) so that they
adhere to the walls of said cavities (12),
- the volume limited by said leaves (2) is filled with the
15 product to be packaged, and
- the perimetral line welding is completed across said
interruption (16).

13. A method as claimed in claim 12, characterised in that
the two leaves (2) to be brought together are obtained by
20 longitudinally folding a continuous web (8).

14. A method as claimed in claim 12, characterised in that
the two leaves (2) are welded together along said perimetral
line by thermowelding.

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15. A method as claimed in claim 12, characterised in that the two leaves (2) are welded together along said perimetral line by ultrasound.

16. A method as claimed in claim 12, characterised in that 5 said leaves (2) are welded together while retained between said half-moulds (10).

17. A method as claimed in claim 12, characterised in that the two half-moulds (10) are kept hot while injecting the fluid.

10 18. A method as claimed in claim 12, characterised by using leaves (2) consisting of a layer of yieldable paper (4) joined to two plastic films (6) applied to both sides thereof.

19. A method as claimed in claims 12 and/or 17, 15 characterised in that the fluid is compressed gas.

20. A method as claimed in claim 19, characterised in that the fluid is heated compressed gas.

21. A method as claimed in claim 12, characterised in that the fluid is the actual product to be packaged.

20 22. Package obtained through the method according to one or more of claims 5-21 characterised in that it consists of a concave container to the edge of which a closure film is applied after the filling.

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23. A package obtained through the method as claimed in one or more of claims 5-21 characterised in that it consists of two concave valves joined together along the facing edges.

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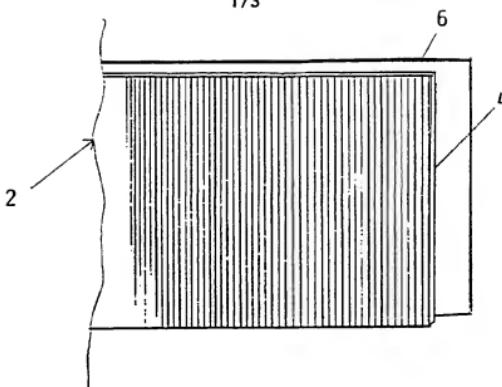


FIG. 1

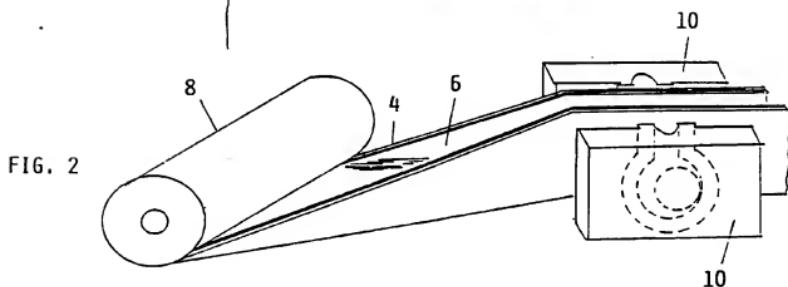
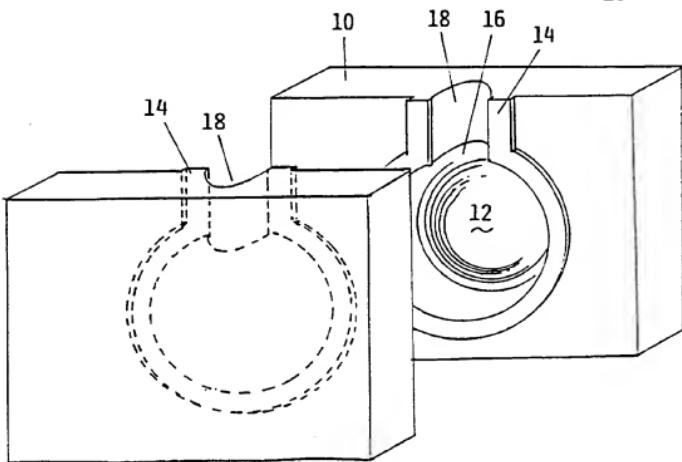


FIG. 2

FIG. 3



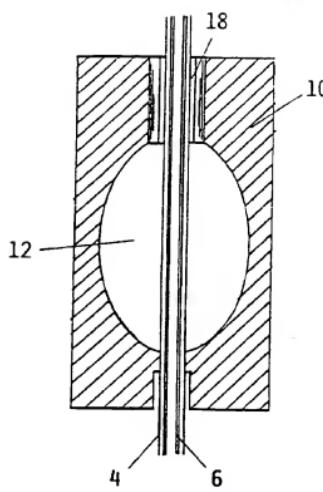


FIG. 4

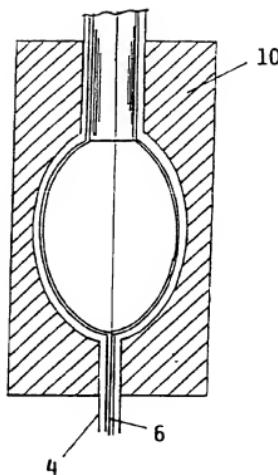


FIG. 5

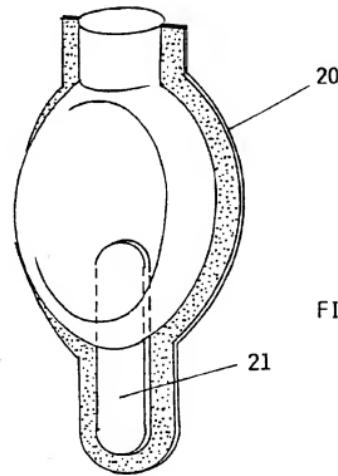
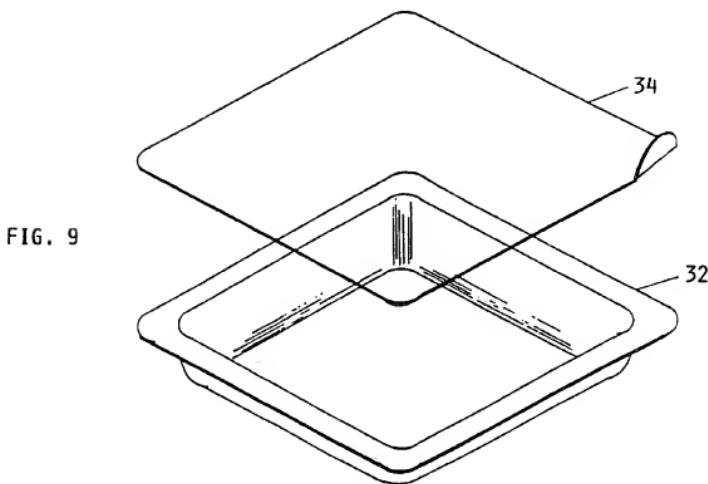
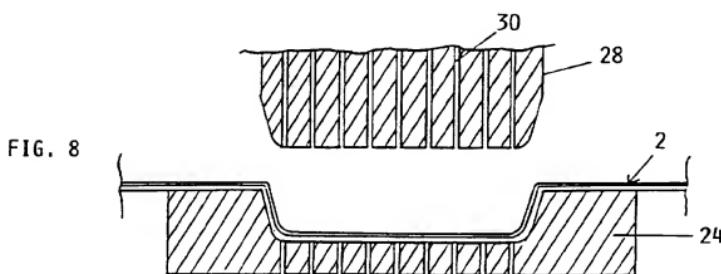
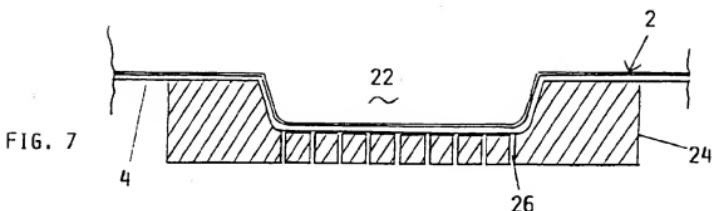


FIG. 6



INTERNATIONAL SEARCH REPORT

Int'l Application No
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Classification of subject matter
 IPC 6 B32B9/00 B65D1/28 B29C69/00 B31F1/00 B29C51/14
 B65D75/32

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y		5-7, 10-12, 18,23
X	US,A,4 026 458 (MORRIS JERALD A ET AL) 31 May 1977 see column 2, line 18 - line 62 see column 4, line 21 - line 35 see column 4, line 45 - line 66 see column 5, line 29 - line 52; figures ---	1-3,5,7 -/-

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INTERNATIONAL SEARCH REPORT

International Application No
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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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